LITTLE BLUE BOOK NO. 835
Edited by E. Haldeman-Julius

A Handbook of Useful Tables

Lloyd E. Smith

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A HANDBOOK OF USEFUL TABLES

NOTE.

If the user of these tables needs information concerning arithmetical processes he is referred to *Arithmetic Self Taught* (Little Blue Books Nos. 856-857).

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A HANDBOOK OF USEFUL TABLES

I. NOTATION

A. *Roman*

In the Roman system of notation letters of the alphabet (capitals) stand for figures. A smaller number-symbol standing before a larger denotes subtraction (IV = 4); a smaller number-symbol following a larger denotes addition (VI = 6); a symbol following one of equal value is to be added to it (III = 3); a smaller symbol between two larger symbols is to be subtracted from their sum (MCM = 1900). A horizontal line above a symbol multiplies its value by 1000 ($\overline{V}$ = 5,000). Roman numerals are used nowadays only for ordinal numbers, particularly in the names of kings and popes (Louis XV; Pius XI), and without the former period. They are also used in various places where it is desired to give a certain (somewhat false) dignity to an inscription, or to be rather arbitrarily elite, as on clock dials, tombstones, milestones, formal invitations, bookplates, etc.

Roman numerals with their Arabic (see B) equivalents follow:

I	=	1	XXX	=	30
II	=	2	XL	=	40
III	=	3	L	=	50
IV	=	4	LX	=	60
V	=	5	LXX	=	70
VI	=	6	LXXX	=	80
VII	=	7	XC	=	90
VIII	=	8	C	=	100
IX	=	9	CC	=	200
X	=	10	D	=	500
XI	=	11	CM	=	900
XII	=	12	M	=	1,000
XIII	=	13	MCM	=	1,900
XIV	=	14	MM	=	2,000
XV	=	15	$\overline{\text{V}}$	=	5,000
XVI	=	16	$\overline{\text{VI}}$	=	6,000
XVII	=	17	$\overline{\text{X}}$	=	10,000
XVIII	=	18	$\overline{\text{L}}$	=	50,000
XIX	=	19	$\overline{\text{C}}$	=	60,000
XX	=	20	MCMXXIV	=	1924

B. *Arabic*

The Arabic system of notation is in universal use. It consists of nine digits and a cipher (1-2-3-4-5-6-7-8-9-0). In this system the value of any digit depends on its position relative to other digits—the value of a digit being multiplied by ten for every digit placed to the

right of it. Similarly, in decimal fractions, the value is divided by ten for every digit placed to the left of a numeral (on the righthand side of the decimal point). Thus:

Units	1
Tens	12
Hundreds	123
Thousands	1,234
Tens of Thousands	12,345
Hundreds of Thousands	123,456
Millions	1,234,567
Tens of Millions	12,345,678
Hundreds of Millions	123,456,789
Billions	1,234,567,890
Tenths	.1
Hundredths	.12
Thousandths	.123
Ten-Thousandths	.1234
Hundred-Thousandths	.12345
Millionths	.123456
Ten-Millionths	.1234567
Etc.	

As shown, it is customary to divide integral numbers into groups of three with commas, counting from right to left (from the decimal point, understood at the end of an integral number although not written). Decimals are

not so divided. Ciphers must be added to decimals when necessary to express the fractional part desired, thus: .0001 = one ten-thousandth. The terminology of numbers above a million varies somewhat. *A billion* in the United States (after the French) is one thousand millions. In England a *billion* is a million millions. Above a billion the names are *trillion* (British *billion*), *quadrillion* (British *thousand billion*), *quintillion* (British *trillion*), *sextillion* (British *thousand trillion*), etc. Numbers of such inconceivable size are seldom used, and when used are seldom given to the last digit—that is, they are expressed as some power of 10—"1,000,000" or "10^6".

II. LONG MEASURE (LENGTH)

12 inches = 1 foot
3 feet = 1 yard
5½ yards = 1 rod (or pole)
40 rods = 1 furlong
8 furlongs = 1 mile

Summary of Equivalents:

1 Yard = 3 feet; 36 inches.
1 Rod = 5½ yards; 16½ feet; 198 inches.

1 Furlong = 40 rods; 220 yards; 660 feet; 7,920 inches.

1 Mile = 8 furlongs; 320 rods; 1,760 yards; 5,280 feet; 63,360 inches.

Special Measurements:

1 Fathom = 6 feet (originally the greatest spread of a man's arms; used to measure the depth of water by soundings, also in mining, and to measure the length of cordage and cables.)

1 League = 3 miles (in English-speaking countries; varies elsewhere from 2.4 to 4.6 miles, or from 3.9 to 7.4 kilometers) in either statute, a Land League being 4.83 kilometers (3 Land Miles of 5,280 feet each), and a Marine League being 5.56 kilometers (3 Nautical Miles of 6,080 feet each). The League is now used only indefinitely or poetically, meaning a "long ways."

1 Roman Mile = 1,620 yards (1,482 meters).

1 Nautical (or Geographical) Mile = 6,080.27 feet, or 1,853.248 meters (in U. S.); the British or Admiralty Mile being 6,080 feet, or 1,853.2 meters; the French Nautical Mile equalling 1,851.9 meters, or 6,076.1 feet. The International Geographical Mile = 4.61 statute miles

of 5,280 feet each (1/15 of a degree of the earth's equator).

1 Knot = 1 Nautical Mile per hour (being thus a measure, not of length, but of velocity; "landlubbers" use the Knot as a synonym for Nautical Mile; originally it was a division of the log-line, marked off by knots at equal distances, being 47.33 feet with a 28-second glass, and 50.75 feet with a 30-second glass).

1 Size = ⅓ of an inch (length), ¼ of an inch (girth), in measuring shoes.

1 Hand = 4 inches (the supposed width of the palm), used in measuring the height (taken at the shoulder) of horses.

1 Chain = 100 Links (each 7.92 inches), more specifically known as Gunter's chain. Gunter's chain contains 4 rods, 22 yards, or 66 feet. It is the standard surveyor's measurement in the United States, and is the recognized legal unit in deeds. (Ramsden's, or the "engineer's chain," contains 100 links of 1 foot each.)

1 Degree (of Latitude) = about 69 miles (varying from 362,756 feet at 0°—the equator—to 366,033 at 70°, and increasing with the distance from the equator).

1 Degree (of Longitude) = about 69 miles at the equator (decreasing as the poles are approached, being only 53 miles in the latitude of New York).

Metrical Equivalents (see Table VIII-A):

1 inch = 2.54 centimeters
1 foot = 30.48 centimeters
1 yard = .9144 meter
1 rod = 5.029 meters
1 furlong = 201.16 meters

Abbreviations:

in. = inch (inches)
ft. = foot (feet)
yd(s). = yard(s)
m. = mile(s)

Note: It is best to use the same abbreviation for singular and plural expressions, without adding the optional "s".

III. SQUARE MEASURE (AREA)

144 square inches = 1 square foot
9 square feet = 1 square yard
30¼ square yards = 1 square rod
160 square rods = 1 acre
640 acres = 1 square mile

Summary of Equivalents:

1 Square Yard = 9 square feet; 1,296 square inches.

1 Square Rod = 30¼ square yards; 272¼ square feet; 39,204 square inches.

1 Acre = 160 square rods; 4,840 square yards; 43,560 square feet; 6,272,640 square inches.

1 Square Mile = 640 acres; 102,400 square rods; 3,097,600 square yards.

Special Measurements:

1 Scotch Acre = about 6,150 square yards.
1 Irish Acre = 7,840 square yards.

Various English Acres of local application range between 440 and more than 10,000 square yards.

1 Rood = ¼ acre, or 40 square rods.

1 Square Chain = 1/10 acre, or 16 square rods (surveyor's measure: see Table II, Chain).

1 Square = 100 square feet (used in measuring roofing, flooring, etc.).

1 Township = 36 square miles. The Township is the unit of survey in public lands, under the Acts of 1785 and 1796. Each township is divided by north-lines and south-lines, running at right angles to each other, into 36 sections, each 1 mile square, and each section therefore containing 640 acres. Sections have been divided into quarter sections (since 1805), each containing ¼ square mile or 160 acres; and into quarter quarter-sections, or eighth sections (since 1832), each containing ⅛ square mile, or 80 acres.

1 Acre, if measured off in a perfect square, is a lot measuring 208⅔ feet on a side.

Metrical Equivalents (see Table VIII-B):

1 square inch = 6.452 square centimeters
1 square foot = 9.288 square decimeters
1 square yard = .836 square meter
1 acre = 4,047 square meters (centares)

Abbreviations:

sq. in. = square inch (inches)
sq. ft. = square foot (feet)
sq. yd(s). = square yard(s)
a. = acre(s)

IV. CUBIC MEASURE (VOLUME)

1,728 cubic inches = 1 cubic foot
27 cubic feet = 1 cubic yard

Summary of Equivalents:

1 Cubic Yard = 27 cubic feet; 46,656 cubic inches.

Special Measurements:

1 Perch = 24¾ cubic feet (used in measuring stone or brick). A perch of stone is 16½ feet long, 1½ feet wide, and 1 foot high.

1 Cord = 128 cubic feet (used in measuring wood, cut for fuel). The legal dimensions of a cord of wood are 8 feet by 4 feet by 4 feet.

1 Board Foot = 1/12 cubic foot = 144 cubic inches = .0023 m^3 = 1 ft. × 1 ft. × 1 in.

1 Load = 50 cubic feet (of timber); 1 cubic yard (of earth). See Table VII, of Weights.

Metrical Equivalents (see Table VIII-C):

1 cubic inch = 16.38 cubic centimeters
1 cubic foot = 28.33 cubic decimeters
1 cubic yard = 765 cubic decimeters

Abbreviations:

cu. in. = cubic inch (inches)
cu. ft. = cubic foot (feet)
cu. yd(s). = cubic yard(s)

V. LIQUID MEASURE (CAPACITY)

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
31½ gallons = 1 barrel
2 barrels = 1 hogshead

Summary of Equivalents:

1 Quart = 2 pints; 8 gills.
1 Gallon = 4 quarts; 8 pints; 32 gills.
1 Barrel = 31½ gallons; 126 quarts; 252 pints; 1,008 gills.
1 Hogshead = 2 barrels; 63 gallons; 252 quarts; 504 pints.

Special Measurements:

1 Minim = .95 drop of water (apothecaries' fluid measure; roughly, a minim is equivalent to 1 drop, or .06 cubic centimeter). 60 Minims =

1 Fluid Dram (3.7 cubic centimeters); 8 fluid drams = 1 fluid ounce; 16 fluid ounces = 1 pint (apothecary); 8 pints (apothecary) = 1 gallon (apothecary).

1 Barrel also = 43 1/5 gallons (31½ gallons in U. S. wine-measure).

Metrical Equivalents (see Table VIII-D):

1 gill = .12 liter
1 pint = .47 liter
1 quart = .95 liter
1 gallon = 3.78 liters

Abbreviations:

gi. = gill(s)
pt(s). = pint(s)
qt(s). = quart(s)
gal(s). or gall(s). = gallon(s)
bbl(s). = barrel(s)
hhd(s). = hogshead(s)

VI. DRY MEASURE (CAPACITY)

2 pints = 1 quart
8 quarts = 1 peck
4 pecks = 1 bushel

Summary of Equivalents:

1 peck = 8 quarts; 16 pints.
1 bushel = 4 pecks; 32 quarts; 64 pints.

Legal U. S. Weight Equivalents: 1 Bushel (oats) = 32 pounds; 1 Bu. (barley) = 48 lbs.; 1 Bu. (corn or rye) = 56 lbs.; 1 Bu. (wheat) = 60 lbs.; 1 Bu. (dried apples) = 26 lbs.; 1 Bu.

(beans) = 60 lbs.; 1 Bu. (onions) = 57 lbs.; 1 Bu. (peas) = 60 lbs.; 1 Bu. (potatoes) = 60 lbs.; 1 Bu. (coarse salt) = 80 lbs. (Pa.), 50 lbs. (Ill.); 1 Bu. (fine salt) = 62 lbs. (Pa.), 55 lbs. (Ill., Ky.); 1 Bu. (corn meal) = 48 lbs.; 1 Bu. (grass seed) = 44 lbs.

Special Measurements:

1 Chaldron = from 32 to 36 bushels (in England; in the U. S. from 2,500 to 2,900 pounds), used chiefly as a measure of coal and coke.

1 Sack = 12 pecks (British), or 109 liters.

The British bushel is about .97 of a U. S. bushel; 32 British = 33 U. S. bushels (nearly).

Metrical Equivalents (see Table VIII-D):

1 pint = .55 liter
1 quart = 1.1 liters
1 peck = 8.81 liters
1 bushel = .35 hectoliter

Abbreviations:

pt(s). = pint(s)
qt(s). = quart(s)
pk(s). = peck(s)
bu. = bushel(s)

VII. MEASURES OF WEIGHT

16 ounces = 1 pound
100 pounds = 1 hundredweight
20 hundredweight = 1 ton

Summary of Equivalents:

1 Hundredweight = 100 pounds; 1,600 ounces.
1 Ton = 20 hundredweight; 2,000 pounds; 32,000 ounces.

Special Measurements:

The preceding equivalents are usually classed as AVOIRDUPOIS weights, especially when it is desirable to distinguish them from APOTHECARY and TROY weights. Avoirdupois units are used for all commercial (business) purposes in the United States. Apothecary units are used chiefly by druggists in making up prescriptions of medicine; druggists buy these same drugs, however, by avoirdupois weight. Troy weight is used by jewelers and goldsmiths, and by the government mints for weighing coins.

1 Hundredweight (British) = 112 pounds. (The even 100 pounds is also used.)

1 Quarter (U. S.) = 25 pounds; 1 Quarter (British) = 28 pounds—also, in dry measure, 8 bushels (varying up to 16), or ½ ton of grain, or ¼ chaldron of coal (see Table VI).

1 Ton of 2,000 pounds (based on the 100-pound hundredweight) is called a SHORT Ton; 1 Ton of 2,240 pounds (based on the 112-pound hundredweight) is called a LONG or GROSS Ton.

The very smallest weight is 1 Grain and 27⅓ of these grains make 1 Dram, and 16

Drams make 1 Ounce (Avoirdupois). The pound is usually rated as 7,000 grains.

1 Metric Ton = 2204.6 pounds (see Metric Table VIII-E).

1 Load = 2,016 pounds (old hay); 2,166 pounds (new hay); 1,296 pounds (straw); 576 pounds (ore).

A. *Apothecaries' Weights*

20 grains = 1 scruple
3 scruples = 1 dram
8 drams = 1 ounce
12 ounces = 1 pound

The Apothecary pound, ounce, and grain units have the same weights as those of Troy units.

B. *Troy Weights*

24 grains = 1 pennyweight
20 pennyweights = 1 ounce
12 ounces = 1 pound

1 Carat = 3.2 grains (200 milligrams, legally). 150 carats = 1 troy ounce. Originally a twenty-fourth part by weight of a gold mark, and now used to denote the proportion of pure gold in an alloy, thus: 18 carats fine = 18/24 or ¾ pure gold; 14 carats fine = 14/24 or 7/12 pure gold; etc.

The Grain is the same in all three systems of weights, but the ounce varies (437½ grains = 1 ounce avoirdupois; 480 grains = 1 ounce apothecary or troy), and the pound varies

(7,000 grains = 1 pound avoirdupois; 5,760 grains = 1 pound apothecary or troy).

Metrical Equivalents (see Table VIII-E):

1 ounce avoirdupois =	28.35 grams
1 ounce troy or apoth. =	31.1 grams
1 scruple =	1.3 grams
1 pennyweight =	1.55 grams
1 pound avoirdupois =	453.6 grams
1 pound troy or apoth. =	373.27 grams
1 ton (short) =	9.07 quintals

Abbreviations:

gr(s). = grain(s)
dr(s). = dram(s)
oz. = ounce(s)
lb(s). = pound(s)
dwt(s). = pennyweight(s)
cwt(s). = hundredweight(s)
T. = ton(s)

VIII. THE METRIC SYSTEM

The Metric System of weights and measures belongs properly with the Arabic system of numerical notation and with the United States system of coin-denominations, for it is based entirely upon a decimal division (by tens). This system is legal for all purposes only in France and some other countries, but it is used throughout the world for scientific measurements of all kinds. Its ultimate adoption by all civilized countries seems inevitable. Once the fundamental principles are understood, the

system is simplicity itself. All the metric units are based on or derived from the *meter*, which is one ten-millionth part of the distance from the equator to the pole.

A. *Long Measure (Length)*

10 millimeters = 1 centimeter
10 centimeters = 1 decimeter
10 decimeters = 1 meter
10 meters = 1 decameter
10 decameters = 1 hectometer
10 hectometers = 1 kilometer
10 kilometers = 1 myriameter

It is thus seen that the denominations progress regularly by tens—the names of the denominations descending from the meter taking a Latin prefix to show the fractional part of a meter (*deci*meter, 1/10 meter; *centi*meter, 1/100 meter; etc.), and the names of the denominations ascending from the meter taking a Greek prefix to show the multiple of a meter (*deca*meter, 10 meters; *kilo*meter, 1,000 meters; etc.). (A multiple of 1,000,000 is denoted by *mega-*; a millionth part by *micro-*.) The names of the units of area, capacity, and weight, follow the same system of prefixes. Of the measures above, those in common use are the millimeter, the centimeter, the meter, and the kilometer.

Summary of Equivalents:

1 millimeter = .001 meter; 1 centimeter = .01 meter; 1 decimeter = .1 meter; 1 decame-

ter = 10 meters; 1 hectometer = 100 meters; 1 kilometer = 1,000 meters; 1 myriameter = 10,000 meters.

Conversion Equivalents:

1 millimeter = .0394 inch
1 centimeter = .3937 inch
1 decimeter = 3.937 inches
1 meter = 39.37 inches
1 decameter = 393.7 inches
1 hectometer = 328 feet, 1 inch
1 kilometer = .62137 mile (or 3,280 ft., 10 in.)
1 myriameter = 6.214 miles

In the United States the legal equivalent of the meter is as above, but in Great Britain and France it is differentiated more closely as 39.37079 inches.

Abbreviations:

mm. = millimeter
cm. = centimeter
dm. = decimeter
m. = meter
km. = kilometer

A decameter is distinguished from a decimeter (dm.) by capitalizing the abbreviation (Dm.). In metrical abbreviations the period is often omitted.

B. *Square Measure (Area)*

100 sq. millimeters = 1 sq. centimeter
100 sq. centimeters = 1 sq. decimeter
100 sq. decimeters = 1 sq. meter (centare)
100 sq. meters = 1 sq. decameter (are)
100 sq. decameters = 1 sq. hectometer (hectare)
100 sq. hectometers = 1 sq. kilometer

The preceding units are the standard units for measurements of surface, but in measuring areas of land the basic unit is the *are*, which equals 100 square meters.

10 milliares = 1 centiare
10 centiares = 1 deciare
10 deciares = 1 are
10 ares = 1 dekare
10 dekares = 1 hectare

Conversion Equivalents:

1 square millimeter = .00155 square inch
1 square centimeter = .155 square inch
1 square meter = 10.764 square feet
1 square meter = 1.196 square yards
1 square kilometer = .3861 square mile
1 centare = 1,550 square inches
1 are = 119.6 square yards
1 hectare = 2.471 acres

Abbreviations:

mm^2., cm^2., m^2., etc. = square millimeter, square centimeter, square meter, etc.

a. = are
ca. = centare
ha. = hectare

To distinguish a *deciare* from a *dekare*, *da.* and *Da.* are used, respectively.

C. *Cubic Measure (Volume)*

1000 cubic millimeters = 1 cubic centimeter
1000 cubic centimeters = 1 cubic decimeter
1000 cubic decimeters = 1 cubic meter

For measuring wood, excavations, and similar matters of volume, a unit called the *stere* is used:

10 centisteres = 1 decistere
10 decisteres = 1 stere
10 steres = 1 decastere
10 decasteres = 1 hectostere
10 hectosteres = 1 kilostere

Conversion Equivalents:

1 cubic millimeter = .000061 cubic inch
1 cubic centimeter = .0610 cubic inch
1 cubic meter = 35.314 cubic feet
1 cubic meter = 1.3079 cubic yards
1 hectostere = 130.8 cubic yards

Abbreviations:

mm^3., cm^3., m^3., etc. = cubic millimeter, cubic centimeter, cubic meter, etc.
s. = stere
cs., ds. = centistere, decistere
Ds., hs., ks. = Decastere, etc.

D. *Dry and Liquid Measure (Capacity)*

10 millileters = 1 centileter
10 centileters = 1 decileter
10 decileters = 1 liter (dm^3)
10 liters = 1 decaliter
10 decaliters = 1 hectoliter
10 hectoliters = 1 kiloliter

Conversion Equivalents:

	Metric		Dry		Liquid
1 milliliter	= 1 cm^3	=	.061 cu. in.	=	.27 fluid drs.
1 centiliter	= 10 cm^3	=	.6102 cu. in.	=	.338 fluid oz.
1 deciliter	= 1/10 dm^3	=	6.1022 cu. in.	=	.845 gill
1 liter	= 1 dm^3	=	.114 pk.; .908 qt.	=	1.0567 qts.
1 decaliter	= 10 dm^3	=	9.08 qts.	=	2.64 gals. (standard)

1 hectoliter	= 1/10 m^3	=	3.35 pks.; 2.84 bu.	=	26.42 gals. (standard)
1 kiloliter	= 1 m^3	=	1.308 cu. yds.	=	264.17 gals.
		=	28.37 bu.		(standard)

Abbreviations:

ml. = milliliter
cl. = centiliter
dl. = deciliter
l. = liter
dal. = decaliter
hl. = hectoliter
kl. = kiloliter

E. *Units of Weight*

10 milligrams = 1 centigram
10 centigrams = 1 decigram
10 decigrams = 1 gram
10 grams = 1 decagram
10 decagrams = 1 hectogram
10 hectograms = 1 kilogram
10 kilograms = 1 myriagram
10 myriagrams = 1 quintal
10 quintals = 1 tonneau (millier)

Conversion Equivalents:

1 milligram = .015 grain
1 centigram = .154 grain
1 decigram = 1.543 grains
1 gram = 15.432 grains
1 gram = .03527 ounce (avoirdupois)
1 gram = .03215 ounce (troy)
1 decagram = .3527 ounce (avoirdupois)
1 hectogram = 3.527 ounces (avoirdupois
1 kilogram = 2.204 pounds (avoirdupois)
1 kilogram = 2.679 pounds (troy)
1 quintal = 220.46 pounds (avoirdupois)
1 tonneau = 1 metric ton (2,204.6 lbs. avoirdupois)

Abbreviations:

mg. = milligram
cg. = centigram
dg. = decigram
g. = gram
kg. = kilogram
q. = quintal
t. = tonneau

F. *Metric Interlocking*

The metric system is clearly the most efficient system thus far devised, for it always interlocks. This is demonstrated by the following tables of equivalents within the system itself.

1 gram of water (maximum density) = 1 cm^3 = 1 milliliter
1 dm^3 = 1000 cm^3 = 1000 g (of water) = 1 kg
1 quintal = 100 dm^3 = 1 hectoliter = 100 kg
1 are = 100 m^2
1 stere = 1 m^3 = 1 kiloliter

G. *Everyday Equivalents*

The American with a pocketful of United States silver coins can very easily approximate metrical equivalents of weight and measure. Four U. S. dimes (use, of course, the newest possible—the result can be only approximate, for coins lose weight and substance in circulation) weigh about 10 grams, equal to the weight of 1 centiliter of water at its maximum density. The nickel, or five-cent piece, can be used for measuring, for its diameter is 2 centimeters

and its weight is 5 grams. Five nickels placed in a row will thus equal 1 decimeter. The weight of $40 in U. S. subsidiary silver coin will approximate 1 kilogram.

IX. TIME

60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day
7 days = 1 week
2 weeks = 1 fortnight
4 weeks = 1 month
30 days = 1 month (commercial)
12 months = 1 year
52 weeks = 1 year
365 days = 1 year
(365.24 days = 1 common year)
(365.256 days = 1 sidereal year)
366 days = 1 leap year (bissextile year)
10 years = 1 decade
100 years = 1 century

The figures for the years in parentheses are mathematical precisions. The other names are sometimes exact and sometimes approximate (7 days in a week is exact, but 4 weeks in a month is approximate). Four months have 30 days each: April, June, September, and November. All the other months, February excepted, have 31 days; February has 28 days, or exactly four weeks, except leap years, when the extra

day is added to February, making 29. Or, as expressed in an old jingle:

Thirty days hath September,
April, June, and November;
All the rest have thirty-one,
Excepting February alone,
Which hath but twenty-eight, in fine,
Till leap year gives it twenty-nine.

Any year the numerals of which are exactly divisible by four (except those divisible by 100 and not by 400) is a leap year, thus: 1924 or 2000 (not 1900). This is according to the *Gregorian* (after Pope Gregory XIII) or *New Style* calendar, in use throughout the civilized world—the correction being necessary to keep the number of days equivalent to the so-called mean solar year.

The adjustment of the calendar has resulted in many changes, and these changes are certainly not ended yet (the possibility of a 13-month year, each month containing 28 days or exactly four weeks, is by no means remote). The adoption of the Gregorian adjustment was somewhat slow. An act of 1752 (Great Britain) changed the beginning of the year from the 25th of March (with March the first month, Octo-ber was eighth, Novem-ber ninth, and Decem-ber tenth) to the 1st of January, and to make the adjustment complete ordered the omission of September 3d to 13th inclusive of that year. Nothing ever occurred, therefore, on September 10, 1752!

THE DAY OF THE WEEK.—To determine the day of the week which any date fell upon or will fall upon the following tables may be found useful (after W. S. B. Woolhouse). The first table gives the *dominical letters*, which are a guide to the second table. The dominical letters are the first seven letters of the alphabet, corresponding to the seven days of the week—in any year the first of January is A, and, counting therefrom, the letter that falls on the first Sunday of the year is the dominical letter for that year. This letter (G for 1923), if the seven dominical letters are repeated in rotation throughout the year, will always fall on Sunday (except in leap years, when two dominical letters are required—F and E for 1924—the first of which is used previous to February 29th, and the second after February 29th).

Year of the Current Century				Completed Centuries			
				1700 2100 2500 etc.	1800 2200 2600 etc.	1900 2300 2700 etc.	2000 2400 2800 etc.
0				C	E	G	BA
1	29	57	85	B	D	F	G
2	30	58	86	A	C	E	F
3	31	59	87	G	B	D	E
4	32	60	88	FE	AG	CB	DC
5	33	61	89	D	F	A	B
6	34	62	90	C	E	G	A
7	35	63	91	B	D	F	G
8	36	64	92	AG	CB	ED	FE
9	37	65	93	F	A	C	D
10	38	66	94	E	G	B	C
11	39	67	95	D	F	A	B
12	40	68	96	CB	ED	GF	AG
13	41	69	97	A	C	E	F
14	42	70	98	G	B	D	E
15	43	71	99	F	A	C	D
16	44	72	....	ED	GF	BA	CB
17	45	73	....	C	E	G	A
18	46	74	....	B	D	F	G
19	47	75	....	A	C	E	F
20	48	76	....	GF	BA	DC	ED
21	49	77	....	E	G	B	C
22	50	78	....	D	F	A	B
23	51	79	....	C	E	G	A
24	52	80	....	BA	DC	FE	GF
25	53	81	....	G	B	D	E
26	54	82	....	F	A	C	D
27	55	83	....	E	G	B	C
28	56	84	....	DC	FE	AG	BA

After finding the dominical letter in the preceding table, locate it, with the month and day of the month desired in the table below. and

where the two columns coincide the proper day of the week will be found.

Month					Dominical Letter						
Jan-Oct					A	B	C	D	E	F	G
Feb-Mar-Nov					D	E	F	G	A	B	C
Apr-Jul					G	A	B	C	D	E	F
May					B	C	D	E	F	G	A
June					E	F	G	A	B	C	D
August					C	D	E	F	G	A	B
Sept-Dec					F	G	A	B	C	D	E
1	8	15	22	29	Sn	St	F	Th	W	Ts	M
2	9	16	23	30	M	Sn	St	F	Th	W	Ts
3	10	17	24	31	Ts	M	Sn	St	F	Th	W
4	11	18	25	..	W	Ts	M	Sn	St	F	Th
5	12	19	26	..	Th	W	Ts	M	Sn	St	F
6	13	20	27	..	F	Th	W	Ts	M	Sn	St
7	14	21	28	..	St	F	Th	W	Ts	M	Sn

Examples: To ascertain what day of the week March 11, 1855, came upon—using the first table, the 19th century (1800) comes in the second vertical column, and following down for the year 55 we find it in the next to the last horizontal line, which, traced across to the second vertical column gives us G for the dominical letter. In the second table, March is in the second horizontal line; tracing across to G we come to the fourth vertical column, and following this down to the day of the month (11) we find it in the fourth horizontal line below, coinciding with Sn (Sunday), the day of the week. Or, to find the day of the week which November 17, 1924, fell upon, the first table gives the dominical letters F and E,

of which we use E since the date desired is after February 29th; turning to the second table for November, letter E, the 17th day, we find the day of the week is Monday.

STANDARD TIME. — The United States adopted standard time in 1883. Since this date the time has been regulated according to the meridians of 75°, 90°, 105°, and 120° west from Greenwich (England), which are named in the United States: Eastern, Central, Mountain, and Pacific time, respectively. By the act of March 19, 1918, standard time was made legal throughout the country. Eastern Standard Time is therefore legal from the Atlantic coast to a line drawn through Toledo (Ohio), Huntington (West Virginia), Johnson City (Tennessee), Atlanta (Georgia), and Apalachicola (Florida); Central Standard Time is used from the termination of Eastern, to a line drawn through Mandan (North Dakota), McCook (Nebraska), Dodge City (Kansas), and along the western boundaries of Oklahoma and Texas; Mountain Time from this line to a line through the western boundary of Montana, following the Salmon River westward, the western boundary of Idaho southward, the southern boundary of Idaho eastward, and south through Salt Lake City (Utah), and Yuma (Arizona); Pacific Time from this line to the Pacific Ocean.

A Table of Time Differences

Showing the time corresponding to 12 o'clock noon (U. S. Eastern Standard) for the leading cities of the U. S. and foreign countries; the starred (*) times are in the morning of the following day.

Alexandria	7:00 p.m.	Los Angeles	9:00 a.m.
Amsterdam	5:20 p.m.	Madrid	5:00 p.m.
Athens	7:00 p.m.	Manila	1:00 a.m.*
Atlanta (Ga.)	11:00 a.m.	Milwaukee	11:00 a.m.
Berlin	6:00 p.m.	New Orleans	11:00 a.m.
Berne	6:00 p.m.	Omaha	11:00 a.m.
Bombay	10:30 p.m.	Paris	5:00 p.m.
Brussels	5:00 p.m.	Petrograd	7:01 p.m.
Chicago	11:00 a.m.	Rome	6:00 p.m.
Copenhagen	6:00 p.m.	Salt Lake City	10:00 a.m.
Dallas	11:00 a.m.	Seattle	9:00 a.m.
Denver	10:00 a.m.	Sitka (Alaska)	7:00 a.m.
Dublin	4:35 p.m.	Vienna	6:00 p.m.
Havana	11:31 a.m.	Yokohama	2:00 a.m.*
Hongkong	1:00 a.m.*		
Honolulu	6:30 a.m.		
Indianapolis	11:00 a.m.		
Kansas City	11:00 a.m.		
Lisbon	4:24 p.m.		
Liverpool	5:00 p.m.		
London	5:00 p.m.		

Since Central Time is one hour earlier than Eastern; Mountain two hours earlier; and so on, the table can be adapted for all parts of the U. S.

Daylight Saving Time, when in use, is one hour later than standard time, so that 12:00 noon, Eastern Standard Time, is 1:00 p.m. Eastern Daylight Saving Time. For Daylight Saving Time one hour must therefore be added to the above figures.

NOTABLE DAYS AND HOLIDAYS.—Notable days in the calendar which are no longer

observed as public holidays, but which are variously celebrated, are:

January 6. Twelfth Day.
February 2. Candlemas.
February 14. St. Valentine's Day
July 15. St. Swithin's Day.
September 29. Michaelmas.
October 31. Hallowe'en
November 1. All Saints' Day

A Table of Public Holidays

In the United States (observed in most states).

Jan. 1. New Year's Day (universal)
Feb. 12. Lincoln's Birthday
Feb. 22. Washington's Birthday (universal)
May 30. Decoration (or Memorial) Day
July 4. Independence Day (universal)
Sept. 1. Labor Day (the first Monday; it happened to be the 1st of Sept. in 1924)
Oct. 12. Columbus Day
Nov. 11. Armistice Day
Nov. 27. Thanksgiving Day (the last Thursday, which happened to be the 27th in 1924)
Dec. 25. Christmas (universal)

EPOCHS, ERAS, AND PERIODS.—A table showing when the principal epochs, eras, and periods began follows:

Grecian Mundane Era	Sept. 1, 5598 B.C.
Alexandrian Era	Aug. 29, 5502 B.C.
Julian Period	Jan. 1, 4713 B.C.
Era of Abraham	Oct. 1, 2015 B.C.
Roman Era	Apr. 24, 753 B.C.
Era of Metonic Cycle	July 15, 432 B.C.
Julian Era	Jan. 1, 45 B.C.
Spanish Era	Jan. 1, 38 B.C.
Augustan Era	Feb. 14, 27 B.C.
Christian Era	Jan. 1, 1 A.D.
Jerusalem Razed	Sept. 1, 69 A.D.
Mohammedan Era	July 16, 622 A.D.

TIME ON SHIPBOARD.—The twelve hours of the day, on board ship, are divided into three watches of four hours each, and at every half hour of each watch a bell is struck, once for the first half hour of the watch, twice for the second, and so on. Beginning at midnight the rotation is as follows, being repeated after eight bells each time:

Bells	Time A.M.	Bells	Time A.M.	Bells	Time A.M.
1	12:30	1	4:30	1	8:30
2	1:00	2	5:00	2	9:00
3	1:30	3	5:30	3	9:30
4	2:00	4	6:00	4	10:00
5	2:30	5	6:30	5	10:30
6	3:00	6	7:00	6	11:00
7	3:30	7	7:30	7	11:30
8	4:00	8	8:00	8	12 Noon

And continuing in rotation through the P.M. hours.

The ship's crew is divided into two watches, usually called the *starboard* and *port* (formerly *larboard*) watches—from the positions of the sailors' bunks in the forecastle. In the merchant service, the starboard watch is also called the captain's watch, although it is often commanded by the second mate. The port watch is, of course, under the first mate. Each of these watches is on duty four hours (the interval being called a *watch*, also), alternating, except for the *dog-watches* of two hours each (4 to 6 and 6 to 8 p.m.) which are inserted to shift night duty from one watch to the other alternately.

X. MISCELLANEOUS TABLES

A. *Common Units*

12 units = 1 dozen (doz.)
12 dozen = 1 gross (gr.)
144 units = 1 gross
12 gross = 1 great gross
20 units = 1 score

B. *Paper Measure*

24 sheets = 1 quire
20 quires = 1 ream (480 sheets)
500 sheets = 1 ream (commercial)
2 reams = 1 bundle
5 bundles = 1 bale

C. *Household Measure*

(These equivalents are, of course, only approximate.)

120 drops (water) = 1 teaspoonful (1 dram)
2 teaspoonfuls = 1 dessert-spoonful (2 drams)
3 teaspoonfuls = 1 tablespoonful (4 drams)
16 tablespoonfuls = 1 cup
1 cup (or glass) = ½ pint
1 cup (of water) = ½ pound

D. *Angular Measure*

60 seconds (″) = 1 minute (′)
60 minutes = 1 degree (°)
90 degrees = 1 quadrant (right angle)
360 degrees = 1 circle

The *radian* (an arc of a circle equal in length to the radius of the circle of which it is a part) is sometimes used as a unit for measuring angles.

$$1 \text{ radian} = 57^\circ\ 17'\ 45'' = \frac{180}{3.1416}$$

$$1 \text{ degree} = .017453 \text{ radian} = \frac{3.1416}{180}$$

The circle (360 degrees) is sometimes divided by astronomers into signs and sextants:

30 degrees = 1 sign
12 signs = 1 circle
60 degrees = 1 sextant
6 sextants = 1 circle
90 degrees = 1 quadrant
4 quadrants = 1 circle

E. *Temperature*

Temperatures are popularly measured in the United States by what is known as a Fahrenheit thermometer, divided into degrees such that water freezes at 32° and water boils at 212°. To avoid confusion with the Centigrade thermometer (scientific, but common in the countries which use the metric system), a capital F is used, thus: 32° F and 212° F. The following divisions are commonly made on Fahrenheit thermómeers:

Zero	0°	Freezing	32°
Temperate	55°	Summer Heat	76°
Blood Heat	98°		

On the Centigrade thermometer the freezing point of water is taken as 0°, and the boiling point is 100°—or the interval between the freezing and the boiling point of water is divided into one hundred degrees. Centigrade temperatures are used in all scientific work. To convert Centigrade degrees to Fahrenheit, multiply by 1.8 and add 32. To convert Fahrenheit degrees to Centigrade, subtract 32 and divide by 1.8—the addition or subtraction of 32 being necessary because of the fact that 0° C corresponds to 32° F.

F. *Sizes of Type*

The size of any style of type is measured by the number of *points* in the height of the face. A point is exactly .01383 inch, or about 1/72 inch. There are 996 points in 35 centimeters. Newspapers are ordinarily set in 6-point type (nonpareil), setting twelve lines to a column inch, twenty-four lines making a *stick*. The more common sizes of type are:

Brilliant	3½ point	Bourgeois	9 point
Diamond	4 or 4½ point	Long Primer	10 point
Pearl	5 point	Small Pica	11 point
Agate	5½ point	Pica	12 point
Nonpareil	6 point	English	14 point
Minion	7 point	Columbian	16 point
Brevier	8 point	Great Primer	18 point

Agate (5½ point) is called *ruby* in England. The body matter of Little Blue Books is set in 8-point type (Roman face), and footnotes and

some quoted matter are set in 6-point. Newspaper advertisements are commonly measured in *agate lines*, which average about 14 to an inch.

G. *Table of Medical Signs and Abbreviations*

$\overline{a}\ \overline{a}$	= of each
℞ (prescription)	= take (Latin: *Recipe*)
S.	= mark (Latin: *Signa*); to indicate the notation to be placed on the bottle or box.
Q.S.	= as much as sufficient
Ad.	= add to
Aq.	= water
Solv.	= dissolve
D.	= dose
Hor. Decub.	= at bed time
Gtt.	= drops
ss	= one-half
Ess.	= essence

and others, including the peculiar apothecaries' signs for apothecary weights.

XI. SPECIFIC GRAVITIES

The *specific gravity* of any substance is the ratio of its weight to the weight of an equal volume of some other substance (unless otherwise specified, the "other substance" is water at its maximum density—4° C). When using the metric system the specific gravity is numerically equal to the *density* of a substance (another scientific advantage), which is the mass (weight) per unit of its volume—in the metric system, the density is in *grams per cubic centimeter*. Usually, in the English sys-

tem, density is expressed in *pounds per cubic foot*. To convert the volume of a substance into its weight, therefore, all that is necessary is to multiply the volume by the density (the volume must be expressed in cubic centimeters for the metric system; in cubic feet for the English system).

Substance	Specific Gravity and Density (g per cm^3)	Density (lbs. per cu. ft.)
Air	.001	.076
Aluminum	2.6	162.
Brass	8.1	504.
Bronze	8.5	529.
Copper (cast)	8.7	542.
Ether	.716	44.6
Glass	2.9	186.
Gold	19.26	1204.
Ice	.92	57.4
Iron (pig)	7.2	450.
Lead	11.38	709.6
Mercury	13.62	849.
Platinum	21.5	1342.
Silver	10.5	655.
Steel	7.85	490.
Tin (cast)	7.35	459.
Water	1.	62.42
Zinc	7.	437.5

Knowing that a cubic foot of water weighs

about 62½ pounds (62.42 in the preceding table), the weight of any volume of a body (expressed in cubic feet) can be ascertained by multiplying the volume by 62½ and multiplying that product by the specific gravity of the substance. A table of some other substances and their specific gravities follows:

Antimony	6.62	Flint	2.6	Petroleum	.878
Arsenic	5.73	Granite	2.7	Pine	.4
Asphalt	1.4	Hemlock	.4	Quartz	2.65
Bismuth	9.8	Hickory	.85	Ruby	3.9
Bromine	3.1	Iodine	4.95	Sapphire	3.9
Calcium	1.55	Ivory	1.82	Silicon	2.3
Coal (hard)	1.5	Lard	.95	Sodium	.971
Coal (soft)	1.3	Magnesium	1.74	Sulphur	2.
Coke	1.	Mahogany	.85	Tar	1.
Cork	.25	Marble	2.6	Topaz	3.55
Diamond	3.52	Naphtha	.848	Walnut	.61
Emerald	2.7	Nickel	8.9	Wine	.998
Fat	.93	Oak	.95		

XII. DECIMAL FRACTIONS

A *decimal* is a fractional part of one hundred, divided in multiples of ten—tenths, hundredths, thousandths, etc. Decimals are expressed by placing a period before a single digit to indicate tenths, before two digits to indicate hundredths, and so on; or, counting from left to right from the decimal point (period), the fractional parts are as given in Table I-B (Arabic notation). Following is a table of common fractions with their decimal equivalents:

½	.5	3/16	.1875
¼	.25	5/16	.3125
¾	.75	7/16	.4375
⅓	.33⅓	9/16	.5625
⅔	.66⅔	11/16	.6875
⅛	.125	13/16	.8125
⅜	.375	15/16	.9375
⅝	.625	1/12	.08⅓
⅞	.875	5/12	.41⅔
⅙	.16⅔	7/12	.58⅓
⅚	.83⅓	11/12	.91⅔
1/16	.0625		

XIII. INTEREST COMPUTATIONS

To find the amount of interest on a given principal, multiply the principal (expressed in dollars and cents) by the rate of interest (expressed in decimal form—4% = .04), which gives the result in the amount of interest per year. If for one month, divide this by twelve; if for three months, divide by four; if for one week, divide by 52; and so on—although interest is figured commercially by months of 30 days each. Notes usually run specifically for 30 days, 60 days, or 90 days, rather than for one month, two months, or three months. The commercial year is thus 360 days.

For rapid computation of interest, the following formulas may be of service: Rate 2½%

(principal times .025 times number of days divided by 144); rate 3% (prin. × .03 × no. of days ÷ 120); rate 3½% (prin. × .035 × no. of days ÷ 102.86); 4% (prin. × .04 × no. of days ÷ 90); 5% (prin. × .05 × no. of days ÷ 72); 6% (prin. × .06 × no. of days ÷ 60); 7% (prin. × .07 × no. of days ÷ 51.43); 8% (prin. × .08 × no. of days ÷ 45).

Simple Interest Table

The figures are for the interest on $100.00, expressed in dollars, cents and mills; for fractions or multiples of 100 divide or multiply accordingly.

Time	4%	5%	6%	7%	8%
1 day	.011	.013	.016	.019	.022
2 days	.022	.027	.032	.038	.044
3 days	.034	.041	.050	.058	.067
4 days	.045	.053	.066	.077	.089
5 days	.056	.069	.082	.097	.111
6 days	.067	.083	.100	.116	.133
1 month	.334	.416	.500	.583	.667
2 months	.667	.833	1.000	1.166	1.333
3 months	1.000	1.250	1.500	1.750	2.000
4 months	1.333	1.667	2.000	2.333	2.667
6 months	2.000	2.500	3.000	3.500	4.000
12 months	4.000	5.000	6.000	7.000	8.000

XIV. MULTIPLICATION TABLES

To discover 5×8, move along the 5-line the vertical column at the left until the finger is under 8 in the horizontal line at the top—the answer is thus 40. The multiplication tables from 2 to 12 are known by every grammar-school graduate—or should be. They are given here for the sake of completeness.

In addition tables from 12 to 20 are given, which are used in the same way.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

13	14	15	16	17	18	19	20
14	196	210	224	238	252	266	280
15	210	225	240	255	270	285	300
16	224	240	256	272	288	304	320
17	238	255	272	289	306	323	340
18	252	270	288	306	324	342	360
19	266	285	304	323	342	361	380
20	280	300	320	340	360	380	400

XV. SQUARES, SQUARE ROOTS; CUBES, CUBE ROOTS

The *square* of a number is the product obtained by multiplying the number by itself once ($2 \times 2 = 4$; the square of $2 = 4$); its *square root* is, conversely, that number which when multiplied by itself will give the number at hand (the square root of $4 = 2$, for 2 multiplied by itself $= 4$). Similarly, the *cube* of a number is the product obtained by multiplying the number by itself twice (or using the number three times: $2 \times 2 \times 2 = 8$; the cube of $2 = 8$); and its *cube root* is, conversely, that number which when cubed will give the number at hand (the cube root of $8 = 2$, for 2 cubed $= 8$).

A table of the squares, square roots, cubes, and cube roots of numbers from 1 to 25 follows:

No.	Square	Square Root	Cube	Cube Root
1	1	1.	1	1.
2	4	1.414	8	1.259
3	9	1.732	27	1.442
4	16	2.	64	1.587
5	25	2.236	125	1.71
6	36	2.449	216	1.817
7	49	2.645	343	1.912
8	64	2.828	512	2.
9	81	3.	729	2.08
10	100	3.162	1000	2.154
11	121	3.316	1331	2.224
12	144	3.464	1728	2.289
13	169	3.605	2197	2.351
14	196	3.741	2744	2.41
15	225	3.873	3375	2.466
16	256	4.	4096	2.519
17	289	4.123	4913	2.571
18	324	4.246	5832	2.62
19	361	4.358	6859	2.668
20	400	4.472	8000	2.714
21	441	4.583	9261	2.759
22	484	4.69	10648	2.802
23	529	4.795	12167	2.843
24	576	4.899	13824	2.884
25	625	5.	15625	2.924

XVI. ARITHMETICAL FORMULAS

A. *Area*

Triangle: The area of a triangle is one-half the product of the base times the altitude, or, if the base is b and the altitude h:

$$A = \frac{h \times b}{2}$$

Rectangle: The area of a rectangle is the product of the two sides (length and breadth), or, if the sides are a and b respectively (remember that a *square* is an equilateral rectangle, so comes under this formula):

$$A = a \times b$$

Parallelogram: The area of a parallelogram is the product of the base (or bottom side) times the perpendicular distance (or altitude) from the base to the parallel side opposite, or, if the base is b and the altitude h:

$$A = b \times h$$

Rhombus: The area of a rhombus (or of a square, which is a right-angled rhombus) is equal to one-half the product of the diagonals, or if one diagonal is c and the other d:

$$A = \frac{c \times d}{2}$$

Trapezium: The area of a trapezium is one-half the product of the sum of the two parallel sides times the distance between them, or, if one parallel side is a, the other b, and the distance between them is h:

$$A = \frac{(a \times b) \times h}{2}$$

Ellipse: The area of an ellipse is equal to the product of the axes multiplied by .7854, or if one axis is a and the other b:

$$A = a \times b \times .7854$$

Circle: The area of a circle is equal to the square of the radius times 3.1416, or to one-fourth of the product of the diameter squared times 3.1416, or to the diameter squared times .7854; or, if the radius is r and the diameter $(= 2 \times r)$ d:

$$A = 3.1416 \times r^2 = \frac{3.1416 \times d^2}{4} = .7854 \times d^2$$

Sphere: The surface area of a sphere is equal to four times the square of the radius times 3.1416, or, if the radius is r:

$$A = 4 \times 3.1416 \times r^2$$

Prism: The lateral area of a regular prism is equal to the perimeter (sum of the sides) of a right section times the length, or if s is

the perimeter of the right section, and l is the length:

$$A = s \times l$$

Pyramid: The lateral area of a regular pyramid is equal to one-half the product of the slant height times the length of one side of the base times the number of sides of the base, or if l is the slant height, a is one side of the base, and n is the number of sides:

$$A = \frac{n \times a \times l}{2}$$

B. *Volume*

The volume of any rectangular solid is the product of all three dimensions—width, length, and height, or if b is the width, l the length, and h the height:

$$V = b \times l \times h$$

Pyramid: The volume of a pyramid is equal to one-third of the area of the base times the altitude, or, if the area of the base is a and the altitude is h:

$$V = \frac{a \times h}{3}$$

Sphere: The volume of a sphere is equal to four-thirds of the radius cubed multiplied by 3.1416, or to one-sixth of the diameter cubed

multiplied by 3.1416, or to 4.189 times the radius cubed; or, if the radius is r and the diameter $(=2 \times r)$ d:

$$V = \frac{4 \times 3.1416 \times r^3}{3} = \frac{3.1416 \times d^3}{6} = 4.189 \times r^3$$

Cylinder: The volume of a cylinder is equal to the radius squared times the altitude times 3.1416; or, if r is the radius of the base, and h is the altitude:

$$V = 3.1416 \times r^2 \times h$$

C. *Miscellaneous*

The circumference of a circle is equal to twice the radius times 3.1416, or if the radius is r:

$$C = 2 \times 3.1416 \times r$$

The curved surface of a right cylinder is equal to the radius of the base times the altitude times 3.1416 times 2, or if r is the radius of the base and h the altitude:

$$A = 2 \times 3.1416 \times r \times h$$

XVII. COIN EQUIVALENTS

A. *United States of America*

10 mills = 1 cent ($0.01)
10 cents = 1 dime ($0.10)
10 dimes = 1 dollar ($1.00)
10 dollars = 1 eagle ($10.00)

The five-cent coin is nicknamed *nickel*; the twenty-five cent *quarter* (or slang *two bits*); the fifty-cent *half* (or slang *four bits*).

B. *Great Britain (England)*

4 farthings = 1 penny (1d)
12 pence = 1 shilling (1/–)
20 shillings = 1 pound (1 £)
21 shillings = 1 guinea

There are also half-penny coins. The gold coin of a pound sterling is called a *sovereign*. In English slang the shilling is *bob*, the sovereign *quid*. The pound sterling is equivalent to about $4.87 when at par; the guinea is usually rated at $5.00 exactly.

C. *Other Countries*

The following coins of various countries are arranged alphabetically, with their "nationali-

ty" and equivalents. Values in American money are at par—these values change, often daily, according to the state of "foreign exchange."

Coin	Country	Equivalent U. S.	
balboa	Panama	100 centavos	$1.00
bolivar	Venezuela	20 centavos	$0.193
boliviano	Bolivia	100 centavos	$0.389
colon	Costa Rica	100 centavos	$0.465
dollar	Canada	100 cents	$1.00
dinar	Servia	1 franc	$0.195
drachma	Greece	100 lepta	$0.193
escudo (milreis)	Portugal	10 centavos	$1.08
franc	France (Switzerland)	100 centimes	$0.193
gourde	Haiti	100 cents	$0.965
guilder	Netherlands	100 cents	$0.40
kran	Persia	1/10 toman	$0.08
krona	Sweden (Norway)	100 ore	$0.268
krone	Austria (Hungary; Czecho-Slovakia)	100 heller	$0.20
kroner	Denmark	100 ore	$0.268
lei	Rumania	100 bani	$0.195
lev	Bulgaria	100 stotinki	$0.193
libra	Peru	10 sols	$4.87
lira	Italy	100 centesimi	$0.193
litas	Lithuania	100 centai	$0.10
mark	Germany	100 pfennige	$0.238
markka	Finland	100 pennia	$0.193
milreis	Brazil	1000 reis	$0.548
milreis	Portugal	1000 reis	$1.08

Coin	Country	Equivalent	U. S.
mohur	India	15 rupees	$7.27
peseta	Spain	100 centesimos	$0.195
peso	South America (Spanish)	(1 dollar) 100 cents	$0.965
piaster	Tunis	16 kharoubas	$0.12
piaster	Turkey	40 paras	$0.044
pound	Egypt	100 piasters	$4.943
ruble	Russia	100 kopecks	$0.515
rupee	India	16 annas	$0.32
sucre	Ecuador	100 centavos	$0.487
tael	China	100 candareens	$1.40
tael, haikwan	China	100 candareens	$0.68
tical	Siam	4 salungs	$0.485
yen	Japan	100 sen	$0.49

XVIII. MISCELLANEOUS WEIGHTS AND MEASURES

The following is an alphabetical list of obscure or uncommon American and British weights and measures.

Name	Class	Equivalent
angel	Coin	10 sh.
anker (wine)	CL	10 gal. (Br.)
aum (wine)	CL	30 gal. (Br.)
barge (coal)	WA	21 long T., 4 cwt.
barleycorn	L	1/3 in.
bit	Coin	3d
boll	WA	140 lb.
bolt (cloth)	L	40 yd.
bottle (wine)	CL	1/6 gal. (Br.)

Name	Class	Equivalent
box	WA	90 lb.
brick	WA	7 lb.
bucket	CD	2 pk.
butt (wine)	CL	2 hhd.
cable's length	L	240 yd.
cannon shot distance	L	3 m.
car-load (U. S.)	CD	9 4/9 chaldrons
carolus	Coin	23 sh.
cental	WA	1 cwt.
cistern	WA	16 cwt. (Br.)
clove	WA	7 lb.
coomb	CD	4 bu. (Br.)
crown	Coin	5 sh.
cubit	L	1½ ft.
cut	L	300 yd.
day's journey (Heb.)	L	17 m.
drachm	WA; WT	1 dram
ell (Eng.)	L	45 in.
ell (Scot.)	L	37 in.
fagot	WA	120 lb.
finger	L	1/8 yd.
firkin (ale; beer)	CL	9 gal.
firkin	WA	56 lb.
flask	WT	76 lb.
florin	Coin	2 sh.
fodder	WA	19.5 cwt.
groat	Coin	4d
hank	L	7 skein
hay, new	New for three months	
hay, old	Old on Sept. 1st	
head	WA	6¾ lb.
Jacobus	Coin	25 sh.
keel (coal)	WA	424 cwt. (Br.)
keel (U. S.)	Cu	350 cu. ft.
kilderkin (ale; beer)	CL	18 gal.

Name	Class	Equivalent
last	CD	80 bu. (Br.)
lea	L	120 yd.
line	L	1/12 in.
mark	Coin	13 sh., 4d
mile (Irish)	L	1 3/11 mi.
mile (Scot.)	L	1 1/8 m.
moidore	Coin	27 sh.
nail (cloth)	L	2¼ in.
noble	Coin	6 sh., 8d
noggin	CL	1 gi. (Br.)
octave (wine)	CL	1/8 pipe
pace (itinerary)	L	5 ft.
pace (military)	L	2½ ft.
pace (surface)	S	25 sq. ft.
pack	WA	240 lb.
palm	L	3 in.
perch	L	5½ yd.
perch	S	30¼ sq. yd.
piece (cloth)	L	40 yd.
pig	WA	301 lb.
pin	CL	4½ gal. (Br.)
pipe (wine)	CL	2 hhd.
pocket	WA	168 lb.
point	L	1/10 line
pottle	CD	¼ pk.
pottle	CL	2 qt.
prime	L	1/12 ft.
puncheon	CL	84 gal.
quartern	CD	¼ pk.
quartern	CL	¼ pt.
quartern	WA	4 lb.
rod-weight	WA	27.8 T.
room (coal)	WA	140 cwt. (Br.)
rope	L	20 ft.

Name	Class	Equivalent
runlet (wine)	CL	3/7 tierce
Sabbath day's journey (Heb.)	L	.87 m.
sack	WA	168 lb.
score	WA	20 lb.
seam	WA	120 lb.
ship-load (coal)	WA	20 keel
skein	L	120 yd.
span	L	9 in.
spindle	L	18 hank ; 8.6 m.
square (flooring)	S	11.1 sq. yd.
stack (wood)	Cu	4 cu. yd.
step	L	30 in.
stone	WA	14 lb.
stoup	CL	½ gal.
strike	CD	2 bu.
tank	CL	400 gal. (Br.)
teacup	CL	24 dr. ; 3 fl. oz.
tester	Coin	6d
thread	L	1½ yd.
tierce (wine)	CL	42 gal.
tierce	WA	320 lb.
tod	WA	28 lb.
truss (new hay)	WA	60 lb.
truss (old hay)	WA	56 lb.
truss (straw)	WA	36 lb.
tub	WA	84 lb.
tun (ale ; beer)	CL	252 gal.
wey	WA	182 lb.
wey (load)	CD	40 bu. (Br.)
windle	CD	14 pk.
wine-glass	CL	2 fl. oz.
wrap	L	80 yd.

The abbreviations to show the class, as used

above, are: CD (Capacity Dry); CL (Capacity Liquid); Cu (Cubic); L (Length; S (Surface); WA (Weight Avoirdupois); WT (Weight Troy).

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